AMENDMENTS TO THE CLAIMS:

1-30. (Canceled)

31. (Original) An optical communication system comprising:

an optical transmission means for sending out light signals of different wavelengths as parallel signals;

a multiplexer constituted by an array waveguide grating for wavelength multiplexing/demultiplexing each of the different wavelength light signals sent out from the optical transmission means;

an optical transmission line, to which the wavelength divided and multiplexed light signals outputted from the multiplexer are sent;

a node provided in the optical transmission line and having an array waveguide grating;

a demultiplexer constituted by an array waveguide array for receiving input light signal set along the optical transmission line via the node; and

an optical receiving means for receiving the demultiplexed different wavelength light signals from the demultiplexer;

wherein the demultiplexer includes a predetermined substrate, a first and a second channel waveguide for light wave transfer on the substrate, a channel waveguide array having a plurality of component waveguides having lengths progressively increasing with a predetermined difference between adjacent ones of the waveguides on the substrate, a first slab waveguide for connecting the ends of the first channel waveguides and one end of the channel waveguide array via a waveguide part having a first shape on the substrate, and a second slab waveguide for connecting one end of the second channel waveguides and the other end of the channel waveguide array via a waveguide part having a second shape on the

substrate, and at least the open part of each of the first channel waveguides on the side of the first slab waveguide or the open part of each of the second channel waveguides on the side of the second slab waveguide is flaring in an exponential function shape toward the channel waveguide array.

32. (Original) An optical communication system comprising:

an optical transmission means for sending out light signals of different wavelengths as parallel signals;

a multiplexer constituted by an array waveguide grating for wavelength multiplexing/demultiplexing each of the different wavelength light signals sent out from the optical transmission means;

an optical transmission line, to which the wavelength divided and multiplexed light signals outputted from the multiplexer are sent;

a node provided in the optical transmission line and having an array waveguide grating;

a demultiplexer constituted by an array waveguide array for receiving input light signal set along the optical transmission line via the node; and

an optical receiving means for receiving the demultiplexed different wavelength light signals from the demultiplexer;

wherein the demultiplexer includes a predetermined substrate, a first and a second channel waveguide for light wave transfer on the substrate, a channel waveguide array having a plurality of component waveguides having lengths progressively increasing with a predetermined difference between adjacent ones of the waveguides on the substrate, a first slab waveguide for connecting the ends of the first channel waveguides and one end of the

channel waveguide array via a waveguide part having a first shape on the substrate, and a second slab waveguide for connecting one end of the second channel waveguides and the other end of the channel waveguide array via a waveguide part having a second shape on the substrate, and at least a part of at least the open part of each of the first channel waveguides on the side of the first slab waveguide or the open part of each of the second channel waveguides on the side of the second slab waveguide is flaring in an exponential function shape toward the channel waveguide array.

33. (Original) An optical communication system comprising:

an optical transmission means for sending out light signals of different wavelengths as parallel signals;

a multiplexer constituted by an array waveguide grating for wavelength multiplexing/demultiplexing each of the different wavelength light signals sent out from the optical transmission means;

an optical transmission line, to which the wavelength divided and multiplexed light signals outputted from the multiplexer are sent;

a node provided in the optical transmission line and having an array waveguide grating;

a demultiplexer constituted by an array waveguide array for receiving input light signal set along the optical transmission line via the node; and

an optical receiving means for receiving the demultiplexed different wavelength light signals from the demultiplexer;

wherein the demultiplexer includes a predetermined substrate, a first and a second channel waveguide for light wave transfer on the substrate, a channel waveguide array having

a plurality of component waveguides having lengths progressively increasing with a predetermined difference between adjacent ones of the waveguides on the substrate, a first slab waveguide for connecting the ends of the first channel waveguides and one end of the channel waveguide array via a waveguide part having a first shape on the substrate, and a second slab waveguide for connecting one end of the second channel waveguides and the other end of the channel waveguide array via a waveguide part having a second shape on the substrate, and includes at least the open part of each of the first channel waveguides on the side of the first slab waveguide or the open part of each of the second channel waveguides with respect to the second slab waveguide has a shape part flaring in an exponential function shape represented by a function of a degree higher than the second degree toward the channel waveguide array.

34. (Original) An optical communication system comprising:

an optical transmission means for sending out light signals of different wavelengths as parallel signals;

a multiplexer constituted by an array waveguide grating for wavelength multiplexing/demultiplexing each of the different wavelength light signals sent out from the optical transmission means;

an optical transmission line, to which the wavelength divided and multiplexed light signals outputted from the multiplexer are sent;

a node provided in the optical transmission line and having an array waveguide grating;

a demultiplexer constituted by an array waveguide array for receiving input light signal set along the optical transmission line via the node; and

an optical receiving means for receiving the demultiplexed different wavelength light signals from the demultiplexer;

wherein the demultiplexer including first and second channel waveguides for light wave transfer, a channel waveguide array having a plurality of component waveguides having lengths progressively increasing with a predetermined difference between adjacent ones of the waveguides, a first slab waveguide disposed between the first channel waveguides and one end of the channel waveguide array, and a second slab waveguide disposed between the second channel waveguides and the other end of the channel waveguide array, and at least the open part of each of the first channel waveguides on the side of the first slab waveguide or the open part of each of the second channel waveguides on the side of the second slab waveguide has an open end with an opening width greater than the waveguide width of the first or second channel waveguides, and the shape directed from the stem part of the open part toward the open end is found on the inner side of rectangular shape of the opening width and on the outer side of a second degree curve connecting the stem part and the open end.

35. (Original) The array waveguide grating according to claim 33, wherein the flaring shape part represented by the function of a degree higher than the second degree has such a convex shape that when frequency multiplexed Gaussian waveform light waves pass through their waveguides, their characteristics line in a rage between boundary ranges of characteristics with respect to the transmission width and the cross-talk when they pass through the rectangular waveguides and second degree function shape waveguides.

36. (Original) An optical communication system comprising a plurality of nodes connected by transfer lines into a loop form, wavelength multiplexed and demultiplexed light

signals being transferred along the loop form transfer line, the nodes each including a first array waveguide grating for demultiplexing the multiplexed light signal into light signals of different wavelengths and a second array waveguide grating for multiplexing the demultiplexed light signals of the different wavelengths, wherein the first array waveguide grating includes a predetermined substrate, a first and a second channel waveguide for light wave transfer on the substrate, a channel waveguide array having a plurality of component waveguides having lengths progressively increasing with a predetermined difference between adjacent ones of the waveguides on the substrate, a first slab waveguide for connecting the ends of the first channel waveguides and one end of the channel waveguide array via a waveguide part having a first shape on the substrate, and a second slab waveguide for connecting one end of the second channel waveguides and the other end of the channel waveguide array via a waveguide part having a second shape on the substrate, and at least the open part of each of the first channel waveguides on the side of the first slab waveguide or the open part of each of the second channel waveguides on the side of the second slab waveguide is flaring in an exponential function shape toward the channel waveguide array.

37. (Original) An optical communication system comprising a plurality of nodes connected by transfer lines into a loop form, wavelength multiplexed and demultiplexed light signals being transferred along the loop form transfer line, the nodes each including a first array waveguide grating for demultiplexing the multiplexed light signal into light signals of different wavelengths and a second array waveguide grating for multiplexing the demultiplexed light signals of the different wavelengths, wherein the first array waveguide grating includes a predetermined substrate, a first and a second channel waveguide for light wave transfer on the substrate, a channel waveguide array having a plurality of component

waveguides having lengths progressively increasing with a predetermined difference between adjacent ones of the waveguides on the substrate, a first slab waveguide for connecting the ends of the first channel waveguides and one end of the channel waveguide array via a waveguide part having a first shape on the substrate, a second slab waveguide for connecting one end of the second channel waveguides and the other end of the channel waveguide array via a waveguide part having a second shape on the substrate, and at least a part of at least the open part of each of the first channel waveguides on the side of the first slab waveguide or the open part of each of the second channel waveguides on the side of the second slab waveguide is flaring in an exponential function shape toward the channel waveguide array.

38. (Original) An optical communication system comprising a plurality of nodes connected by transfer lines into a loop form, wavelength multiplexed and demultiplexed light signals being transferred along the loop form transfer line, the nodes each including a first array waveguide grating for demultiplexing the multiplexed light signal into light signals of different wavelengths and a second array waveguide grating for multiplexing the demultiplexed light signals of the different wavelengths, wherein the first array waveguide grating includes a predetermined substrate, a first and a second channel waveguide for light wave transfer on the substrate, a channel waveguide array having a plurality of component waveguides having lengths progressively increasing with a predetermined difference between adjacent ones of the waveguides on the substrate, a first slab waveguide for connecting the ends of the first channel waveguides and one end of the channel waveguide array via a waveguide part having a first shape on the substrate, a second slab waveguide for connecting one end of the second channel waveguides and the other end of the channel waveguide array via a waveguide part having a second shape on the substrate, and at least the open part of each

of the first channel waveguides on the side of the first slab waveguide or the open part of each of the second channel waveguides with respect to the second slab waveguide has a shape part flaring in an exponential function shape represented by a function of a degree higher than the second degree toward the channel waveguide array.

39. (Original) An optical communication system comprising a plurality of nodes connected by transfer lines into a loop form, wavelength multiplexed and demultiplexed light signals being transferred along the loop form transfer line, the nodes each including a first array waveguide grating for demultiplexing the multiplexed light signal into light signals of different wavelengths and a second array waveguide grating for multiplexing the demultiplexed light signals of the different wavelengths, wherein the first array waveguide grating includes first and second channel waveguides for light wave transfer, a channel waveguide array having a plurality of component waveguides having lengths progressively increasing with a predetermined difference between adjacent ones of the waveguides, a first slab waveguide disposed between the first channel waveguides and one end of the channel waveguide array, a second slab waveguide disposed between the second channel waveguides and the other end of the channel waveguide array, at least the open part of each of the first channel waveguides on the side of the first slab waveguide or the open part of each of the second channel waveguides on the side of the second slab waveguide has an open end with an opening width greater than the waveguide width of the first or second channel waveguides, and the shape directed from the stem part of the open part toward the open end is found on the inner side of rectangular shape of the opening width and on the outer side of a second degree curve connecting the stem part and the open end.

40. (Original) The optical communication system according to claim 38, wherein the flaring shape part represented by the function of a degree higher than the second degree has such a convex shape that when frequency multiplexed Gaussian waveform light waves pass through their waveguides, their characteristics line in a rage between boundary ranges of characteristics with respect to the transmission width and the cross-talk when they pass through the rectangular waveguides and second degree function shape waveguides.

41-45. (Canceled)